

Chapter 6

Evaluation of pharmacological values of *Alloteropsis cimicina* (L.) Stapf: a fodder grass

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ABSTRACT

In tropical India, several grass species thrive across diverse ecological strata such as forest fringes, grasslands, and wetlands, contributing to soil stability, nutrient cycling, and wildlife sustenance. Among them, *Alloteropsis cimicina*, a lesser-studied member of the family Poaceae, stands out for its ecological versatility. It can thrive in diverse habitats, which indicate its adaptive defense mechanisms contributing to the development of a wide range of secondary metabolites. These metabolites could be useful as therapeutic and nutraceutical agent. Therefore, qualitative phytochemical and antioxidant analysis were carried out. Results revealed that polar solvents were more effective in extracting bioactive compounds than non-polar solvents. Ethanol and aqueous extracts contained tannins, saponins and reducing sugars while alkaloids were specifically detected in the aqueous extract. Non-polar fractions yielded no detectable compounds. Aqueous extract showed highest antioxidant activity. These results suggest that *A. cimicina* harbors significant polar phytoconstituents with antioxidant properties which validate its therapeutic and nutraceutical potential. It could be useful as panacea of different health problems and restoration of grasslands.

Keywords: Bioactive compounds, fodder grass, medicinal, nutritional

INTRODUCTION

Ecologically versatile grass species are found across ecotones, grasslands, and moist habitats of tropical India (Dey et al., 2024). Though use of grasses as wildlife fodder is commonly observed but they also have diverse applications as remedies to fight against health problems and as an alternate food source during adverse situations (Gebashe et al., 2019). *Alloteropsis cimicina* is one such understudied member of family Poaceae that plays a vital role in sustaining herbivorous wildlife by serving as a natural fodder source during lean seasons. Its tender shoots and leaves are highly palatable (Behera et al., 2025) and provide essential nutrients to grazing animals, contributing significantly to the trophic balance of forest ecosystems. Beyond its ecological role, *A. cimicina* also holds socio-economic importance as a traditional ‘famine food,’ in rural and tribal communities, the grains or flour derived from this grass are consumed during periods of food scarcity (Shah et al., 2019), reflecting its adaptability and nutritional value. Traditionally, the plant has been employed in indigenous healthcare practices for treating gastrointestinal ailments and as a folk remedy for maintaining hyperglycemia (Lohar and Arora, 2019). Thus, it becomes important to study the phytochemistry and radical-scavenging properties of such understudied but common grasses that can be helpful in developing plant-based therapeutics for conditions like Diabetes mellitus. Understanding its dual function as both a survival food and a promising medicinal grass would not only be essential for promoting its conservation and sustainable utilization but also its inclusion in fighting modern world diseases and managing climate-resilient ecosystems.

METHODOLOGY

Whole plants of *Alloteropsis cimicina* were collected from Puri district, Odisha, India (Figure 1). The species was taxonomically identified by the authors following Behera et al. (2025). The collected plants were thoroughly washed under running tap water to remove surface impurities and air-dried. The dried powder of collected grass was used for extraction using the Soxhlet apparatus with three solvents (n-hexane, ethanol, and

water) for subsequent experimental analyses (Jena et al., 2025). Qualitative phytochemical screening for the detection of secondary metabolites and Thin Layer Chromatography (TLC)-based antioxidant assays was conducted following standard protocols (Kumar et al., 2013; Pattnaik and Bhatnagar, 2023; Jena et al., 2025).



Figure 1: Plant parts of *Alloteropsis cimicina*

RESULTS AND DISCUSSION

The qualitative phytochemical screening of *Alloteropsis cimicina* revealed that solvent polarity significantly influenced metabolite extraction. Non-polar fractions showed no detectable compounds. Polar solvents, however, effectively extracted bioactive compounds (Table 1; Figure 2-4). The ethanol extract contained tannins, saponins, and reducing sugars, whereas the aqueous extract showed the presence of tannins, saponins, alkaloids, and reducing sugars. This suggests that the bioactive components of *A. cimicina* are primarily polar in nature. These metabolites contributed towards the potential antioxidant efficacy of the species. The thin-layer chromatography (TLC) based 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay confirmed the evidence by showing antioxidant activity in the aqueous extract (Table 2; Figure 5). The ethyl acetate: methanol: water system produced three distinct spots (R_f 0.809, 0.936, and 0.984), the chloroform: ethyl acetate: formic acid system showed two spots (R_f 0.916 and 0.983), while the n-hexane: petroleum ether: ethanol system exhibited fewer active components, with spots at R_f 0.4 and 0.75 and a streak from 0–0.25. These findings demonstrated that *A. cimicina* contain diverse range of polar antioxidant compounds with notable free radical scavenging potential.

Table 1: Qualitative phytochemical analysis of *A. cimicina*

Polarity	Extract	Detected secondary metabolites
Non-Polar  Polar	n-Hexane	All tested bioactive compounds are not detected.
	Ethanol	Tannin, Saponin and Reducing sugars
	Aqueous	Tannin, Saponin, Alkaloid and Reducing sugars



Figure 2: Phytochemical analysis of *A. ciminica* using n-hexane extract



Figure 3: Phytochemical analysis of *A. ciminica* using ethanolic extract

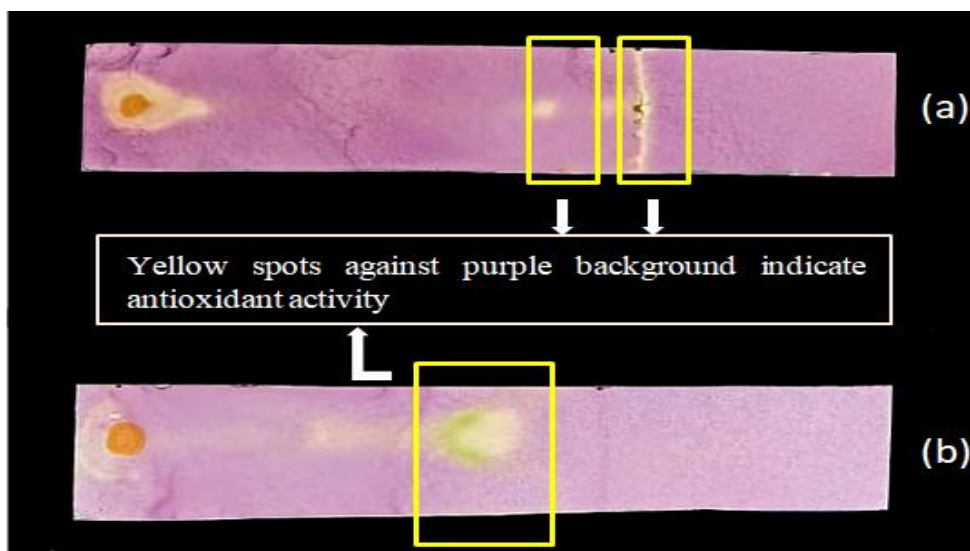


Figure 4: Phytochemical analysis of *A. ciminica* using aqueous extract

Table 2: TLC-based DPPH analysis of whole plant extract of *A. cimicina* using different mobile phases

	Mobile Phases	Rf value of Spots			
		S1	S2	S3	Streak
Aqueous	Ethyl acetate: Methanol: Water (40:5.4:4)	0.809	0.936	0.984	-
	Chloroform: Ethyl acetate: Formic acid (5: 4: 1)	0.916	0.983	-	-
	n-Hexane: Petroleum ether: Ethanol (10: 10: 80)	0.4	0.75	-	0 – 0.25

(Rf: Retention factor)

Figure 5: Antioxidant activity of *Alloteropsis cimicina* using (a) Ethyl acetate: Methanol: Water and (b) n-Hexane: Petroleum ether: Ethanol

Multiple ethnobotanical surveys across India and neighboring regions recorded *A. cimicina* both as a supplementary and seasonal food (used as flour or boiled like rice) and as a folk remedy (Shah et al., 2019). Reported traditional uses include treatments for diabetes and digestive complaints like flatulence and indigestion (Lohar and Arora, 2019). A combined study of LC–MS profiling with bioassays (Nischitha and Shivanna, 2021)

reported several putative compounds in methanolic extract but still, evidential scientific data on the species with deeper insights remains scarce.

CONCLUSION

Present study showed that *Alloteropsis cimicina* is a rich source of polar phytochemicals with notable antioxidant potential. Ethanol and aqueous extracts exhibited diverse bioactive compounds, with the aqueous extract showing the highest radical scavenging activity in TLC-DPPH assay. These findings suggest that *A. cimicina* could serve as a promising natural source of antioxidants and secondary metabolites of pharmacological relevance and a nutraceutical fodder grass. Further research on its bioactive compound isolation, mechanism of action, and potential product development could enhance its application in both ecological restoration and herbal formulation sectors.

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